

## Medical Science

### To Cite:

Khan R, Shahid S, Nadeem A, Ayesha M, Afzaal T, Arif A, Saghir A, Maqsood G, Arshad M, Saadat S, Qasim M, Rehman T, Iqbal MZ. Knowledge, attitude, and practice regarding multivitamin products and their uses among healthcare providers and students at a private medical college in Lahore. *Medical Science* 2024; 28: e58ms3366 doi: <https://doi.org/10.54905/diss.v28i148.e58ms3366>

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### Peer-Review History

Received: 07 April 2024  
 Reviewed & Revised: 11/April/2024 to 08/June/2024  
 Accepted: 12 June 2024  
 Published: 18 June 2024

### Peer-review Method

External peer-review was done through double-blind method.

Medical Science  
 pISSN 2321-7359; eISSN 2321-7367



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# Knowledge, attitude, and practice regarding multivitamin products and their uses among healthcare providers and students at a private medical college in Lahore

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## ABSTRACT

**Background:** The consumption of multivitamin products has increased substantially in the last few years, prompting this study to investigate the knowledge, attitude, and practice (KAP) of multivitamin use among students from various healthcare faculties at a private medical college in Lahore, Pakistan. **Objective:** The study aimed to evaluate factors affecting the knowledge, attitude, and practice of multivitamin use among future healthcare providers in a private medical college in Lahore. **Methodology:** Our cross-sectional study, conducted from August 2022 to November 2022, surveyed final and pre-final year students across medicine, pharmacy, and dentistry faculties. We used a validated questionnaire to assess the impact of demographic factors (gender, age, faculties, year of study, and place of living) on multivitamin usage. The questionnaire featured sections on knowledge, attitude, and practices. The descriptive statistics (percentage, frequency, mean) were analyzed using SPSS version 21. Inferential statistics (one-way ANOVA) were applied to find the correlation among the variables. **Result:** The results of our current study indicated a statistically significant difference in knowledge about multivitamins among different age groups with  $p=0.001$ . The study also found a substantial difference in the use of multivitamins among students from other faculties, with a  $p$ -value of 0.055 and no statistically significant difference in attitude towards multivitamin use across various demographic factors. **Conclusion:** Although age and faculty affiliation

affected knowledge and patterns of multivitamin usage, attitudes towards multivitamin use were consistent across all demographic groups.

**Keywords:** Knowledge, Attitude, Practice, multivitamins, healthcare providers, dietary supplements.

## 1. INTRODUCTION

Diet and nutrition significantly influence the maintenance of health and disease prevention (Block et al., 2007). In today's society, individuals with busy schedules frequently struggle to maintain an adequate diet. Individuals who skip meals owing to time constraints and those who struggle to consume regular food, such as the sick and old, sometimes rely on multivitamins or dietary supplements to maintain their health (El-Kadiki and Sutton, 2005; Sebastian et al., 2007). In recent years, there has been a progressive shift among the population in eating habits and nutritional patterns, coinciding with the improvement in their standard of living (Liu et al., 2018). Consuming an imbalanced diet causes a deficiency of essential micronutrients (Perez-Escamilla et al., 2018). There has been a significant rise in the use of multivitamin products in recent years, with approximately 20 to 30% of the population in developed countries regularly using multivitamin supplements (Sekhri and Kaur, 2014; McNaughton et al., 2005).

The global market for dietary supplements is worth \$152 billion. Research conducted in the United States found that 49% of adults use nutritional supplements, with 44% of males and 53% of females being documented users (Bailey et al., 2011). As per the World Health Organization (WHO), there is a growing global need for health products, with about 80% of the world's population utilizing these items. Pakistan is located in South Asia and experiences greater demand for nutraceuticals. Chronic non-communicable diseases (NCDs) such as cancer, type 2 diabetes, osteoarthritis, and obesity are significant public health issues in both developed and developing countries. Physical inactivity, alcohol consumption, and stress are often the cause of non-communicable diseases (NCDs).

Nutrients can potentially modify the underlying pathogenic pathways associated with these diseases (Wu et al., 2015). Antioxidants mitigate oxidative harm; folic acid controls DNA methylation, and vitamin D and calcium impact bone metabolism (Huang et al., 2007). Excessive consumption of multivitamin supplements can lead to unanticipated health complications. Therefore, the extensive use of supplements sometimes raises concerns due to the possibility of negative consequences such as neurological problems, gastrointestinal issues, liver damage, defects of birth, and interactions with other drugs (Sharma et al., 2014). There has been a rise in the use of multivitamins among young people, with surveys conducted in the United States showing that over 66% of college students use multivitamins (Lieberman et al., 2015).

In addition, the survey found that 74% of students with a background in health sciences reported taking multivitamins, compared to non-health sciences students (Moore and Saddam, 1999). Healthcare professionals who possess information regarding multivitamins should apply logical decision-making when using these pharmaceutical drugs in their practice. The program instructs individuals on how to choose, assess, and justify the usage of multivitamins. The hypothesis suggests that individuals' ideas and attitudes toward multivitamins can affect their decision to utilize them. Therefore, this study was carried out among healthcare provider students enrolled in a private medical college in Lahore, Pakistan, to document their knowledge, attitude, and practice about the usage of multivitamins.

## 2. MATERIAL & METHODS

This research employed a cross-sectional study design to assess the knowledge, attitudes, and practices regarding multivitamins among final-year and pre-final-year students at a private medical college in Lahore. The study targeted students enrolled in the faculty of pharmacy, medicine, and dentistry. The participants were diverse in age, gender, race, and living status. Data collection for the study occurred between August 9th and November 30th, 2022, utilizing a validated questionnaire. This research study aimed to assess knowledge, attitude, and perception of multivitamin products among future healthcare providers in a private medical university in Lahore, Pakistan. The survey targeted pre-final and final-year medical, dental, and pharmacy students from private medical college, with a minimum sample size of 50 from each faculty. However, 286 students participated.

### Inclusion criteria

The study included all pre-final and final-year medical, dental, and pharmacy students willing to participate and filled the distributed form.

### Exclusion criteria

The exclusion criteria include first-year, second-year, and third-year students of medicine, dental, and pharmacy at private medical college.

Students from the physiotherapy, biotechnology, and nutrition sciences departments at the private medical college are also excluded from the study.

### Data collection method

The questionnaire assessed knowledge, attitude, and perceptions of multivitamins and their use among future healthcare providers among a private medical college student. A few expert lecturers then verified it. After validating the questionnaire and making the necessary changes, we obtained the final version. This study used a structured questionnaire with 36 questions categorized into knowledge, attitude, and practice of multivitamin use. The Likert scale (strongly disagree, disagree, neutral, agree, and strongly agree) was used as a linear scale in Section A, which is attitude-based. Section B (knowledge questions) is based on the selection of correct answers. In Section C (practice questions), participants select either "yes" or "no" for their answers.

The first part of the questionnaire included an informed consent form and collected demographic details such as gender, age, faculty, year of study, and place of living. The second part of the form includes ten attitude-based questions, ten knowledge-based questions, and ten practice-based questions. The linear scale questions (attitude-based) ranging from "strongly disagree" to "strongly agree" are scored from 1 to 5. The strongly disagree scored 1, disagree scored 2, neutral scored 3, agree scored 4, and strongly agree scored 5. In the knowledge and perception-based questions, the correct answer scored 1, and the wrong answer scored 0. Practice-based questions consist of two options, either "yes" or "no", where only one correct answer can be chosen.

### Ethical approval and confidentiality

The Lahore Medical and Dental College Human Ethics Committee approved the study protocol, including demographic authorization, on July 4, 2022. After reviewing ethical aspects, the Faculty Research Committee obtained ethical clearance. Participants were informed about the study and agreed to participate. All their information was kept confidential for research purposes only.

### Statistical Analysis

The collected data were entered into SPSS version 21. A descriptive analysis was then conducted to determine the percentage, frequency, mean, and standard deviation for the quantitative data. The normality of the data was checked using SPSS with the Kolmogorov-Smirnov test, and the assumptions of Skewness and Kurtosis tests were verified to confirm the normality of the distributed data. Parametric tests, such as the One-way ANOVA test, were used, and a p-value of less than 0.05 was considered statistically significant.

## 3. RESULTS

The study included 286 participants who completed the questionnaire. Among them, most of the respondents were females (59%), and the rest were males (41%). One hundred and nineteen participants were from the faculty of medicine, 120 from the faculty of pharmacy, and 47 from the faculty of dentistry. Among them, 208 students were from the pre-final year, and 78 participants were from the final year. The largest age group of participants (78%) fell between 21 and 25 years old. Additionally, 76% of the 286 participants classify as non-hostile.

Table 1 indicates no significant differences ( $p > 0.05$ ) in student attitudes toward multivitamins based on gender, faculty, age, year of study, or place of living. Table 2 summarizes the practice of students regarding the use of multivitamins, and it demonstrates a significant difference among faculties with  $p = 0.005$ . According to Crohom's classification,  $\eta^2$  is 0.020, indicating a weak positive association. On the other hand, gender, year of study, age, and place of living showed no significant difference. Table 3 suggests a

statistically significant difference in knowledge about multivitamins among different age groups with  $p=0.001$  and  $\eta^2$  is 0.047, suggesting a small positive association. Compared to other variables, the  $p$ -value observed was much higher than the commonly used threshold of  $p > 0.05$ . That indicates no statistically significant difference in knowledge about multivitamins concerning gender, faculty, year of study, or place of living.

**Table 1** Attitude of Students on Multivitamin use

Outcome Variable	Mean (SD)	95% Confidence Interval (C.I)		<i>t</i> - statistic ( <i>df</i> )	<i>p</i> -value	Effect size ( $\eta$ 2)
		Lower bounds	Upper bounds			
Gender						
Male	41.12±4.72	40.26	41.98	8.65 (1, 284)	0.536	-
Female	41.47±4.76	40.75	42.20			
Faculty						
Medicine	41.05±3.75	40.36	41.73	28.54 (2, 283)	0.531	-
Pharmacy	41.70±5.79	40.65	42.74			
Dentistry	41.08±3.93	39.92	42.24			
Age						
18-20	40.32±5.54	38.86	41.78	38.16 (2, 283)	0.183	-
21-25	41.57±4.51	40.97	42.16			
>25	42.20±3.78	37.70	47.10			
Year of Study						
Pre-final Year	41.22±4.96	40.54	41.90	8.046 (1, 284)	0.550	-
Final Year	41.60±4.09	40.68	42.52			
Place of living						
Hostellar	41.03±5.91	39.60	42.46	7.989 (1, 284)	0.552	-
Non-hostellar	41.42±4.32	40.85	42.00			

**Table 2** Practice of Students on Multivitamin use

Outcome Variable	Mean (SD)	95% Confidence Interval (C.I)		<i>t</i> - statistic ( <i>df</i> )	<i>p</i> -value	Effect size ( $\eta^2$ )
		Lower bounds	Upper bounds			
Gender						
Male	5.46±1.85	5.16	5.83	4.552 (1,284)	0.255	-
Female	5.75±1.87	5.47	6.04			
Faculty						
Medicine	5.43±1.82	5.11	5.77	10.078 (2,283)	0.055	0.020
Pharmacy	5.96±1.80	5.63	6.28			
Dentistry	5.38±2.05	4.78	5.98			
Age						
18-20	5.67±1.73	5.22	6.13	2.378 (2,283)	0.506	-
21-25	5.62±1.88	5.37	5.87			
>25	6.60±2.88	10.18	10.18			
Year of Study						
Pre-final Year	5.63±1.87	5.37	5.89	0.114 (1,284)	0.857	-
Final Year	5.68±1.86	5.26	6.10			

Place of living						
Hostellar	5.34±2.03	4.85	5.83	8.497 (1,284)	0.118	-
Non-hostellar	5.74±1.81	5.50	5.98			

Table 3 Knowledge of Students on Multivitamin use

Outcome Variable	Mean (SD)	95% Confidence Interval (C.I)		<i>t- statistic (df)</i>	<i>p-value</i>	<i>Effect size (η2)</i>
		Lower bounds	Upper bounds			
Gender						
Male	19.47±2.65	18.99	19.95	0.029 (1,284)	0.948	-
Female	19.45±2.52	19.07	19.83			
Faculty						
Medicine	19.42±2.47	18.97	19.87	11.585 (2,283)	0.173	-
Pharmacy	19.72±2.18	19.32	20.11			
Dentistry	18.89±3.53	17.85	19.93			
Age						
18-20	18.41±3.69	17.44	19.38	43.831 (2,283)	0.001	0.047
21-25	19.70±2.13	19.41	19.98			
>25	21.00±1.87	18.68	23.32			
Year of Study						
Pre-final Year	19.38±2.81	19.00	19.77	4.112 (1,284)	0.431	-
Final Year	19.65±1.76	19.26	20.05			
Place of living						
Hostellar	19.29±2.74	18.63	19.96	2.397 (1,284)	0.548	-
Non-hostellar	19.51±2.52	19.17	19.85			

4. DISCUSSION

The current research assesses knowledge, attitude, and consumption of multivitamins among students of different faculty. In the current study, we examined student's knowledge of multivitamins and found no significant gender-based differences. This result suggested that both male and female students have an equal level of understanding about the use of multivitamins, their benefits, and their potential risks. The possible reasons could be that male and female students receive the same information about multivitamins in their coursework and practical training sessions, leading to similar knowledge levels. A similar study conducted in Jordan revealed no significant difference in the knowledge of multivitamins between males and females (Ghazzawi et al., 2022). However, another study of 679 participants in Saudi Arabia found a statistically significant relationship between gender and knowledge about multivitamins ( $P < 0.01$ ) (Algaeed et al., 2019).

The probable reason behind this could be the large number of participants included in the study, and data also showed that the number of females was more in contrast to males. The data reveals no significant differences in knowledge based on the faculty. Students from the Medicine, Pharmacy, and Dentistry faculties all demonstrated similar levels of knowledge about multivitamins, suggesting that the curriculum and exposure to health-related information across these disciplines are comparable. Similarly, the year of study (pre-final year versus final year) showed no significant difference in knowledge. It is possible that students consistently receive information about multivitamins from lectures, textbooks, and other educational resources throughout their academic years. The place of living, whether students lived in hostels or off-campus, also showed no significant difference in knowledge levels.

The results indicate that living arrangements do not affect students' access to or retention of information regarding multivitamins. The study carried out at the College of Medicine of the University of Lagos, Idi-Araba, Lagos, consisting of 300 students from the final

year of various departments in the College of Medicine, demonstrated that there exists a significant difference in knowledge and use of multivitamins among students from different departments with pharmacy students having more knowledge. The reason for this could be that pharmacists are involved in dispensing and counseling patients regarding the use of multivitamins, so they continuously update their knowledge to communicate effectively with patients. A descriptive cross-sectional questionnaire-based study conducted on 319 student participants at a medical university in the U.A.E. revealed that no significant association was found between the use of multivitamins and place of living (Rosalia et al., 2017).

The analysis of the current research indicates that knowledge about multivitamins significantly increases with age. Especially students aged >25 years had the highest mean knowledge score ( $21.00 \pm 1.87$ ), followed by those aged 21-25 years ( $19.70 \pm 2.13$ ), and the youngest group, aged 18-20 years, had the lowest mean score ( $18.41 \pm 3.69$ ). The differences between these age groups were statistically significant. The possible reason for the positive association between age and knowledge about multivitamins could be that as students age, they also advance in their academic careers, thereby gaining more knowledge and experience. In contrast, the study conducted in Malaysia showed that younger participants (under 25 years old) had better knowledge about multivitamins than older students. Various factors, such as differences in study design and sample characteristics, could account for the disparity in our findings (Mohiuddin et al., 2020).

Another study conducted in Canada supports our research findings, indicating that as individuals age, their knowledge of multivitamins increases, and there is a positive correlation between age and expertise in multivitamins (Hoover et al., 2017). The current study's results indicate a significant impact of faculty on the utilization of multivitamins. The analysis indicates pharmacy students have higher mean values ( $5.96 \pm 1.80$ ) compared to medicine and dentistry students, who have mean values of ( $5.43 \pm 1.82$ ) and ( $5.38 \pm 2.05$ ) respectively. The possible reason could be that pharmacy students study pharmacology and are also well aware of the dose, benefits, and risks, ensuring adequate knowledge for the personal use of multivitamins. Similarly, another study conducted in India and Ajman also displayed the significant effect of the faculty on multivitamin use (Sharma et al., 2014; Shahwan and Al-Abdin, 2018).

While the faculty showed a significant effect, other variables such as gender, age, year of study, and place of living did not show substantial differences in multivitamin use. The study conducted in the United States revealed that female students were more likely to take multivitamins than men (Spencer et al., 2006). These findings are contrary to our conclusions. The reason could be that women are more conscious regarding their health and beauty as well as they undergo specific lifetime changes such as during menstruation, pregnancy, breastfeeding, and menopause, and multivitamins can help them to address these changing nutritional requirements. Another study conducted in UAE concluded that as students' progress through the years in medical college, they become more informed about the uses, benefits, and side effects associated with multivitamins (Rosalia et al., 2017).

The current research analysis revealed no significant difference in attitudes toward multivitamin use based on gender, faculty, year of study, age, and place of living. The reason could be that Students in these fields typically have access to the same academic resources. This exposure to uniform information about the benefits and limitations of multivitamins can result in similar attitudes. Similarly, another study conducted in Malaysia aligns with our results that there is no significant association in the attitude of different faculties towards the use of multivitamins (Zakaria et al., 2024). Another study in Pakistan demonstrated no significant associations between demographic factors (gender, age, year of study) and attitude toward multivitamin usage (Abdullah et al., 2023). However, another research conducted in Libya stated that there was a significant difference ( $p=0.001$ ) between the faculties of research and their attitude towards multivitamins (Shaboun et al., 2023).

### Limitations

There are certain limitations associated with this study. This study was conducted in a single city and institute, which might limit the generalizability of the findings to students in different regions or educational settings. The current study did not account for other demographic variables such as socioeconomic status, academic performance, and personal health status, which could potentially influence the knowledge and attitudes towards multivitamin use.



## 5. CONCLUSION

Gender, year of study, and place of living had no debatable association with knowledge and practice of multivitamin use. However, the results showed significant differences regarding knowledge of multivitamins among different age groups. Older students (>25 years) demonstrate higher knowledge levels compared to younger students (18-20 years). Similarly, faculty has a significant effect on the use of multivitamins. The study indicates no significant differences in attitudes toward multivitamin use based on gender, faculty, year of study, age, or place of living. The study highlights the demographic factors such as faculty and age influence knowledge and usage patterns.

### Acknowledgements

We would like to express our sincere gratitude to the Department of Pharmacy Practice, Faculty of Pharmaceutical Sciences, Lahore University of Biological and Applied Sciences, for their invaluable support and guidance throughout the entire research study.

### Ethical Approval

The current research was conducted with the approval of the university's ethical review board, under the ethical process number ERB-PHRMD-DPP/0532-C

### Authors' Contributions

This study was a collaborative effort by all authors. The final manuscript was reviewed and approved by each author.

### Informed Consent

Written and oral informed consent was obtained from all study participants. Additionally, separate informed consent was acquired from participants whose identifying information is included in this manuscript.

### Funding

This study has not received any external funding.

### Conflict of interest

The authors declare that there is no conflict of interests.

### Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

## REFERENCES

1. Abdullah M, Haider SAZ, Waris S, Burki SAA, Ijaz F, Amin B. Frequency, Reasons, and Determinants of Multivitamins Usage Among Undergraduate Medical Students. *Esculapio J SIMS* 2023; 19(3):328-31.
2. Algaeed HA, Aljaber MI, Alwehaibi AI, Aljaber LI, Arafah AM, Aloyayri MA, Binsebayel OA, Alotaqi SA, Alfozan MA, Ahmed IB. General public knowledge and use of dietary supplements in Riyadh, Saudi Arabia. *J Family Med Prim Care* 2019; 8(10):3147-3154. doi: 10.4103/jfmpc.jfmpc\_511\_19
3. Bailey RL, Gahche JJ, Lentino CV, Dwyer JT, Engel JS, Thomas PR, Betz JM, Sempos CT, Picciano MF. Dietary supplement use in the United States, 2003–2006. *J Nutr* 2011; 141(2):261-6. doi: 10.3945/jn.110.133025
4. Block G, Jensen CD, Norkus EP, Dalvi TB, Wong LG, McManus JF, Hudes ML. Usage patterns, health, and nutritional status of long-term multiple dietary supplement users: a cross-sectional study. *Nutr J* 2007; 6:30. doi: 10.1186/1475-2891-6-30
5. El-Kadiki A, Sutton AJ. Role of multivitamins and mineral supplements in preventing infections in elderly people: systematic review and meta-analysis of randomised controlled trials. *BMJ* 2005; 330(7496):871. doi: 10.1136/bmj.38399.495648.8F. Erratum in: *BMJ* 2005; 331(7509):142.
6. Ghazzawi HL, Hazem ESA, Amawi AT. Evaluation of Knowledge, Attitudes, and Practices Related to Dietary Supplements Intake among College Students: A Cross-

- sectional Study. *J Clin Diagnostic Res* 2022; 16(6):OC11-OC17. doi: 10.7860/JCDR/2022/44287.16428
7. Hoover J, Vatanparast H, Chess C, Daoud Y. Knowledge, attitudes, and usage related to dietary supplements in a group of canadian dental students: A pilot study. *Int J Clin Nutr Diet* 2017; 3(121). doi: 10.15344/2456-8171/2017/121
  8. Huang HY, Caballero B, Chang S, Alberg AJ, Semba RD, Schneyer C, Wilson RF, Cheng TY, Prokopowicz G, Barnes GJ, Vassy J, Bass EB. Multivitamin/Mineral Supplements and Prevention of Chronic Disease: Executive Summary. *Am J Clin Nutr* 2007; 85(1):265S-268S. doi: 10.1093/ajcn/85.1.265S
  9. Lieberman HR, Marriott BP, Williams C, Judelson DA, Glickman EL, Geiselman PJ, Dotson L, Mahoney CR. Patterns of dietary supplement use among college students. *Clin Nutr* 2015; 34(5):976-85. doi: 10.1016/j.clnu.2014.10.010
  10. Liu H, Yang Y, Xu D, Xia H, Pan D, Wang S, Sun G. Investigation and comparison of nutritional supplement use, knowledge, and attitudes in medical and non-medical students in China. *Nutrients* 2018; 10(11):1810. doi: 10.3390/n10111810
  11. McNaughton SA, Mishra GD, Paul AA, Prynne CJ, Wadsworth ME. Supplement use is associated with health status and health-related behaviors in the 1946 British birth cohort. *J Nutr* 2005; 135(7):1782-9. doi: 10.1093/jn/135.7.1782
  12. Mohiuddin SG, Aziz S, Iqbal MZ, Naqvi AA, Ahmed R, Mahmoud MA, Ghori SA. Knowledge, attitude, and practice of general population toward complementary and alternative medicines in relation to health and quality of life in Sungai Petani, Malaysia. *J Pharm Bioallied Sci* 2020; 12(1):57-63. doi: 10.4103/jpbs.JPBS\_182\_19
  13. Moore KL, Saddam AM. Dietary supplement use among undergraduate college students. *J Am Diet Assoc* 1999; 99(9):A96. doi: 10.1016/s0002-8223(99)00733-6
  14. Perez-Escamilla R, Bermudez O, Buccini GS, Kumanyika S, Lutter CK, Monsivais P, Victora C. Nutrition disparities and the global burden of malnutrition. *BMJ* 2018; 361:k2252. doi: 10.1136/bmj.k2252
  15. Rosalia R, Panjwani S, Ali AA, Al-Hayali MM, Alahmad AM, Shirwaikar A, Shirwaikar A. A Cross Sectional Survey on the Knowledge and Attitude towards the Use of Multivitamin Products among the Students of a Medical University in the UAE. *J Appl Pharm Sci* 2017; 7(8):201-208.
  16. Sebastian RS, Cleveland LE, Goldman JD, Moshfegh AJ. Older adults who use vitamin/mineral supplements differ from nonusers in nutrient intake adequacy and dietary attitudes. *J Am Diet Assoc* 2007; 107(8):1322-32. doi: 10.1016/j.jada.2007.05.010
  17. Sekhri K, Kaur K. Public knowledge, use and attitude toward multivitamin supplementation: A cross-sectional study among general public. *Int J Appl Basic Med Res* 2014; 4(2):77-80. doi: 10.4103/2229-516X.136780
  18. Shaboun S, Salama L, Salama R, Abdrabba F, Shabon F. Knowledge, Attitude, and Use of Complementary and Alternative Medicine among Final-Year Pharmacy and Medical Students in Benghazi, Libya. *Ibnosina J M Bio Sci* 2023; 15(01):020-8. doi: 10.1055/s-0042-1750084
  19. Shahwan M, Al-Abdin SM. Knowledge and practice of dietary supplement and micronutrients among medical students at Ajman University. *J Pharm Sci Res* 2018; 10(1):85-90.
  20. Sharma A, Adiga S, Ashok M. Knowledge, attitude and practices related to dietary supplements and micronutrients in health sciences students. *J Clin Diagn Res* 2014; 8(8):HC10-3. doi: 10.7860/JCDR/2014/9329.4683
  21. Spencer EH, Bendich A, Frank E. Vitamin and mineral supplement use among US medical students: A longitudinal study. *J Am Diet Assoc* 2006; 106(12):1975-83. doi: 10.1016/j.jada.2006.09.003
  22. Wu F, Guo Y, Chatterji S, Zheng Y, Naidoo N, Jiang Y, Biritwum R, Yawson A, Minicuci N, Salinas-Rodriguez A, Manrique-Espinoza B. Common risk factors for chronic non-communicable diseases among older adults in China, Ghana, Mexico, India, Russia and South Africa: the study on global AGEing and adult health (SAGE) wave 1. *BMC Public Health* 2015; 15:88. doi: 10.1186/s12889-015-1407-0
  23. Zakaria FN, Firdaus FF, Anushka S, Salleh DS, Salleh NM, Panchal K, Qader AM. Assessment of knowledge and perceptions regarding dietary supplements among medical and pharmacy students: a cross-sectional study. *Glob J Public Health Med* 2024; 6(1):1010-20.